

30 June 2005

TELEFAX 5 pp. Original by mail  
FAX: 999-46-8-667 7288

Patent- och registreringsverket  
Valhallavägen 136  
P.O. Box 5055  
S-102 42 STOCKHOLM  
Sweden

Authorized Officer: Lars Wallentin  
Our ref: BP108517/AS/SPO

**REPLY TO WRITTEN OPINION  
INTERNATIONAL PATENT APPLICATION PCT/FI2004/050041  
APPLICANT: ECOCAT OY  
DUE DATE: 4 JULY 2005**

On account of the Written Opinion issued on 22 April 2005 we submit the following:

Previous claim 1 and 8 has been united to new claim 1. New claim 21 (earlier claim 22) has same subject matter as new claim 1. New claims 8–20 and 22–25 correspond earlier claims 9–21 and 23–26. Reference numbering has been changed correspondingly.

New claims are now new. Objective problem solved by new claims is a porous sheet that efficiency reduces particles of exhaust gas in open channels. The problem is solved by the support (33) having the median pore size over 10 nm. This solution can clearly be seen e.g. from results made by prior art substrate and a substrate according to the invention, Figure 14.

Results can be seen from page 11, line 30:

“The reduction of particles with a substrate according to the invention were 33% and 37% and with prior art substrate the reductions was 12%. The results are surprisingly high and clearly demonstrate the efficiency of the invented mesh sheet(s) and substrate having that mesh sheet(s). Nox-reductions were also very high with catalysts according to the invention (9%, 16%) compared to the prior art catalyst (4%). CO-reductions and THC-reductions were at same level with all catalysts.



This shows that the catalyst according to the invention in addition to particle reduction also efficiently reduce components of exhaust gases. This combination makes them very preferably in treating exhaust gases of combustion engines."

The solution is not obvious because those features described in claims fullfill the objective problem in a new combination way not described in prior art. This way is not obvious for a person skilled in the art because there is no hint for that problem solution in those documents either. Thus the solutions are new and inventive.

**BERGGREN OY AB**

Arto Stenroos  
Patent Attorney

**ENCLS:** Amended claims

## Claims

1. A porous sheet for treating exhaust gases of combustion engines in open channels, **characterized** in that at least part of the porous sheet (3, 3a, 3b) has a covering support (33) having the median pore size over 10 nm and coarse particles over 1,4  $\mu\text{m}$  and the area mass of support (33) is from 20 to 200 g/  $\text{m}^2$  and the BET specific surface area of support (33) is from 30 to 300  $\text{m}^2/\text{g}$ .
2. A porous sheet(s) according to claim 1, **characterized** in that essentially all openings (32) of the porous sheet (3, 3a, 3b) have a filling support (33) having pores (35) over 10 nm and coarse particles over 1,4  $\mu\text{m}$ .
3. A porous sheet(s) according to claim 1 or 2, **characterized** in that said porous sheet (3, 3a, 3b) is a mesh sheet.
4. A porous sheet according to claim, 3 **characterized** in that the mesh size of said mesh sheet (3) is from 30 to 300.
5. A porous sheet according to any preceding claim, **characterized** in that said porous sheet is a corrugated sheet (3b).
6. A porous sheet according to any preceding claim, **characterized** in that the median particle size of support (33) is from 1,5 to 3,5  $\mu\text{m}$ .
7. A porous sheet according to any preceding claim, **characterized** in that the median pore size of said support (33) is over 5 nm.
8. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises catalytically active material.
9. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises catalytically inert particles having median particle size from 10 to 200  $\mu\text{m}$ .
10. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises catalytically inert coarse alumina-, silica, zirconia-, ceria- or/and titania-particles.
11. A porous sheet according to any preceding claim, **characterized** in that at least part of support (33) has been milled.

12. A porous sheet according to any preceding claim, **characterized** in that said support (33) comprises fibres, which are projecting out from the plane of said support.
- 5 13. A metal substrate having open channels for treating exhaust gases of combustion engines, **characterized** in that said substrate (1) comprises at least one porous sheet according to claim 1 to 12.
14. A metal substrate according to claim 13, **characterized** in that said substrate (1) comprises at least one other sheet (2a, 2b, 5).
- 10 15. A metal substrate according to claim 14, **characterized** in that said other sheet (2a, 2b, 5) is smooth, perforated, mesh, wire mesh or fibrous sheet.
16. A metal substrate according to claim 13 to 15, **characterized** in that said other sheet is a flat (2b) or corrugated sheet (2a, 5).
- 15 17. A metal substrate according to claim 13 to 16, **characterized** in that other sheet(s) (2a, 2b, 5) has been essentially covered with the support (33) of porous sheet(s) (3, 3a, 3b) according to claim(s) 1 to 15.
18. A metal substrate according to claim 13 to 17, **characterized** in that other sheet(s) (2a, 2b, 5) and porous sheet(s) (3, 3a, 3b) have been covered with same support (33).
- 20 19. A metal substrate according to any claim 13 to 18, **characterized** in that porous sheet(s) (3, 3a, 3b) and/or other sheet(s) (2a, 2b, 5) comprises impressions and/or projections.
20. A metal substrate according to any claim 13 to 19, **characterized** in that said substrate (1) is a pre-oxycatalyst, hydrolysis catalyst and/or a SCR oxycatalyst.
- 25 21. A method for manufacturing a porous sheet for treating exhaust gases of combustion engines in open channels, **characterized** in that the porous sheet (3, 3a, 3b) is at least partially covered with a support (33) having the median pore size over 10 nm and coarse particles over 1,4  $\mu\text{m}$  and having the area mass of support (33) from 20 to 200  $\text{g}/\text{m}^2$  and the BET specific surface area of support (33) from 30 to 300  $\text{m}^2/\text{g}$ .
- 30 22. A method for manufacturing a porous sheet according to claim 21, **characterized** in that the essentially all openings (32) of porous sheet(s) (3, 3a,

3b) are filled with support (33) having the median pore size over 10 nm and coarse particles over 1,4  $\mu$ .

5 23. A method for manufacturing a metal substrate for treating exhaust gases of combustion engines, **characterized** in that at least one porous sheet according to claim 1 to 13 is joined to said substrate (1) so that there are open channels (4) in said substrate.

10 24. A porous sheet(s) according to claims 1 to 13 or manufactured according to a method of any claim of 21 to 22, **characterized** in that said porous sheet(s) (3, 3a, 3b) is used to purify impurity particles (34) from exhaust gases of combustion engines.

25. A metal substrate according to claims 14 to 20 or manufactured according to a method of any claim of 23 to 24, **characterized** in that said substrate (1) is used to purify impurity particles of exhaust gases of combustion engines.

**THIS PAGE BLANK (USPTO)**